

Applicant's patent is based on the requirement for trenches to be in a mesh pattern so that not only is cracking of the IMD far less likely to occur but even if a crack is initiated it is confined to a single cell. This provides for a significant reliability improvement. However, as described in the specifications, it was found by Applicants that void formation occurs to an intolerable degree for completely crossing trenches. The limitation of the invention to prevent void formation by avoiding complete intersection of trenches is included in independent Claims 1, 11 and 21. The limitation that mesh patterns limit crack propagation is inherent in Claims 11 and 21 and, by the present amendment, is now explicit in Claim 1.

Kida uses large area via holes to restrict insulator layer cracking, requiring that at least one via hole per pad have an area that is at least 3% of the pad area. No other requirements are specified concerning restriction of insulator cracking. Neither the shape of the via holes, or the shape of the via hole openings, which are the shapes given in Kida's Fig. 7, are assigned any relevance by Kida to restriction of insulator layer cracking. Kida makes no claim concerning crack propagation or void formation. The via holes of his Fig. 7a are provided in rows and columns with constant interval and no intersections, and therefore meet the limitation concerning the intersection of trenches, and thus the limitation arising from the tendency of void formation at complete intersections. The via pattern of Kida's Fig. 7a does not limit crack propagation and thus does not teach a method to limit crack propagation.

Reconsideration of the rejection of Claims 1, 2, 6-9, 11, 12, 16-19, 20-22 and 26-31 under 35 U.S.C. 103 (a), as being unpatentable over Kida, as applied to Claims 1, 2, 6-10, 12 and 16-19, in view of Huang et al., U.S. Patent 6,236,114 is requested, based on the following argument.

Applicant's patent is based on the requirement for trenches to be in a mesh pattern so that not only is cracking of the IMD far less likely to occur but even if a crack is initiated it is confined to a single cell. This provides for a significant reliability improvement. However, as described in the specifications, it was found by Applicants that void formation occurs to an intolerable degree for completely crossing trenches. The limitation of the invention to prevent void formation by avoiding complete intersection of trenches is included in independent Claims 1, 11 and 21. The limitation that mesh patterns limit crack propagation is inherent in Claims 11 and 21 and, by the present amendment, is now explicit in Claim 1.

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Kida's Fig. 7a does not limit crack propagation and thus does not teach a method to limit crack propagation.

None of the applied or known references address the invention as shown in the amended claims in which a bonding pad is formed that is highly resistant to the formation of IMD cracks and in which the length of cracks that do form are limited by the cell size of a trench mesh pattern and where the trenches of the mesh pattern do not completely intersect thus avoiding a void formation exposure. The invention is believed to be patentable over the prior art cited, as it is respectfully suggested that the combination of these various references cannot be made without reference to Applicant's own invention. None of the applied references address the problem of providing a bonding pad that is resistant to IMD crack formation and where the length of cracks that do form are so limited so as to pose no reliability problem. Furthermore, by limiting the invention so that trenches do not completely intersect problems related to void formation are avoided.

Applicant has claimed his process in detail. The processes of claims 1 – 10, 11-20 and 21-31 are believed to be novel and patentable over these various references, because there is not sufficient basis for concluding that the combination of claimed elements would have been obvious to one skilled in the art. That is to say, there must be something in the prior art or line of reasoning to suggest that the combination of these various references is desirable. We believe that there is no such basis for the combination.

Reconsideration of the rejection of Claims 3 and 13 35 U.S.C. 103 (a), as

being unpatentable over Kida, as applied to Claims 1,2,6-11,12 and 16-19, in view of Saran, U.S. Patent 6,232,662 is requested, based on the following argument.

Applicant's patent is based on the requirement for trenches to be in a mesh pattern so that not only is cracking of the IMD far less likely to occur but even if a crack is initiated it is confined to a single cell. This provides for a significant reliability improvement. However, as described in the specifications, it was found by Applicants that void formation occurs to an intolerable degree for completely crossing trenches. The limitation of the invention to prevent void formation by avoiding complete intersection of trenches is included in independent Claims 1, 11 and 21. The limitation that mesh patterns limit crack propagation is inherent in Claims 11 and 21 and, by the present amendment, is now explicit in Claim 1.

Kida uses large area via holes to restrict insulator layer cracking, requiring that at least one via hole per pad have an area that is at least 3% of the pad area. No other requirements are specified concerning restriction of insulator cracking. Neither the shape of the via holes, or the shape of the via hole openings, which are the shapes given in Kida's Fig. 7, are assigned any relevance by Kida to restriction of insulator layer cracking. Kida makes no claim concerning crack propagation or void formation. The via holes of his Fig. 7a are provided in rows and columns with constant interval and no intersections, and therefore meet the limitation concerning the intersection of trenches, and thus the limitation arising from the tendency of void formation at complete intersections. The via pattern of Kida's Fig. 7a does not limit crack propagation and thus does not teach a method to limit crack propagation.

None of the applied or known references address the invention as shown in the amended claims in which a bonding pad is formed that is highly resistant to the formation of IMD cracks and in which the length of cracks that do form are limited by the cell size of a trench mesh pattern and where the trenches of the mesh pattern do not completely intersect thus avoiding a void formation exposure. The invention is believed to be patentable over the prior art cited, as it is respectfully suggested that the combination of these various references cannot be made without reference to Applicant's own invention. None of the applied references address the problem of providing a bonding pad that is resistant to IMD crack formation and where the length of cracks that do form are so limited so as to pose no reliability problem. Furthermore, by limiting the invention so that trenches do not completely intersect problems related to void formation are avoided. Applicant has claimed his process in detail. The processes of claims 1 – 10, 11-20 and 21-31 are believed to be novel and patentable over these various references, because there is not sufficient basis for concluding that the combination of claimed elements would have been obvious to one skilled in the art. That is to say, there must be something in the prior art or line of reasoning to suggest that the combination of these various references is desirable. We believe that there is no such basis for the combination.

In summary, all claims are now believed to be in allowable condition and reconsideration of the rejections and allowance is therefore respectfully requested.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned

**“VERSION WITH MARKINGS TO SHOW CHANGES MADE”**

It is requested that should there be any problems with this Amendment, please call the undersigned attorney at (845) 452-5863.

Respectfully submitted,

A handwritten signature in black ink, appearing to be 'S. Ackerman', written over the words 'Respectfully submitted,'.

Stephen B. Ackerman, Reg. No. 37,761

**"VERSION WITH MARKINGS TO SHOW CHANGES MADE"**

**In the claims:**

1. A method of forming a bonding pad that is immune to IMD cracking, comprising:
  - providing a partially processed semiconductor wafer having all metal levels completed;
  - forming a blanket dielectric layer over the uppermost metal level;
  - patterning and etching said dielectric layer to form horizontal and vertical arrays of trenches passing through said dielectric layer such that none of said horizontal trenches completely intersects any of said vertical trenches and separating said dielectric layer into cells such that any straight line having points on more than two cells must intersect at least one trench in order to limit the propagation of any cracks that may form;
  - filling said trenches with a conducting material; performing CMP;
  - depositing bonding metal patterns;
  - bonding wires onto said bonding metal patterns;
  - forming a passivation layer.